ABSTRACT

A technique to reduce blocking and ringing artifacts in low bit-rate block-based video coding is applied to each reconstructed frame output from the decoder. For each pixel block of a reconstructed frame, its DC value and DC values of the surrounding eight neighbor blocks are exploited to predict AC coefficients which might be lost in the quantization stage in the encoding process. The predicted AC coefficients are used to classify each reconstructed block as either a low-activity or a high-activity block. Low-pass filtering is then adaptively applied according to the classification of the block. Strong low-pass filtering is applied in low-activity blocks where the blocking artifacts are most noticeable, whereas weak low-pass filtering is applied in high-activity blocks where ringing noise as well as blocking artifacts may exist. The adaptive filtering reduces ringing noise as well as blocking artifacts without introducing undesired blur. In low activity blocks, the blocking artifacts are reduced by one dimensional horizontal and vertical low-pass filters which are selectively applied in either the horizontal and/or vertical direction depending on the locations and absolute values of the predicted AC coefficients. In high activity blocks, de-blocking and de-ringing is conducted by a single filter, applied horizontally and/or vertically, which makes the architecture simple.